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IS 11437 (1985): Ground equipment requirements for compatibility with air craft unit load devices [TED 14: Aircraft and Space Vehicles]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

GROUND EQUIPMENT REQUIREMENT FOR COMPATIBILITY WITH AIRCRAFT UNIT LOAD DEVICES

1. Scope — Covers the requirements for the ground and terminal handling equipment for aircraft unit load devices (ULD) with respect to their compatibility, maintenance and interchangeability.

2. Equipment

2.1 Conveyor Systems for Transport of Devices

2.1.1 Uni-directional conveyor system (rollers)

Characteristic	Requirement
a) Roller diameter	50 mm, <i>Min</i>
b) Roller length	100 mm, <i>Min</i> effective bearing length

The cumulative length of any number of rollers on a common axis shall support at least 50 percent of the corresponding device dimension. A staggered pattern of rollers shall provide equivalent support.

Characteristics	Requirement
c) Lateral spacing between roller ends	406 mm, <i>Max</i>
d) Distance between centreline rollers less than 100 mm in diameter	254 mm, <i>Max</i>
e) Distance between centreline of 100 mm diameter and larger	305 mm, <i>Max</i>
f) Radius at roller edges	3 mm, <i>Min</i>
g) Allowable overhand (distance between roller edge and guide)	152 mm, <i>Max</i>
h) The allowable height difference for rollers shall be a maximum of 3.2 mm in any 1 524 mm × 1 524 mm area and 1.3 mm between any two adjacent rollers. The support structure stiffness and tolerance shall be designed to meet the above requirement when supporting an empty device or one loaded to its maximum payload capacity.	

2.1.2 Multi-directional conveyor (for transient traversing conditions only)

Characteristics	Requirement
a) Allowable spacing for castored rollers throughout the area traversed by the device	250 mm, <i>Max</i> in two directions 90° apart
b) Castored roller diameter	76 mm, <i>Min</i>
c) Castored roller width Edge radius 3 mm <i>Min</i>	25 mm, <i>Min</i> 19 mm contact area
d) Allowable spacing for ball transfers throughout the area traversed by the device, except for those areas where supported by other means	127 mm, <i>Max</i> in two directions 90° apart
e) Diameter of balls	25 mm, <i>Min</i>
f) <i>Balls</i> : Any ball support shall utilize spring-loaded balls with a suggested pre-load close to 310 N and not exceeding 450 N. The ball load at maximum displacement shall not exceed 665 N.	

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- g) The allowable height difference for castored rollers or unloaded ball transfers shall be a maximum of 3.2 mm in any 1524 mm × 1524 mm area, and 1.3 mm between any two adjacent castored rollers or ball transfers. The support structure stiffness and tolerance shall be designed to meet the above requirement when supporting an empty device or one loaded to its maximum payload capacity.

2.2 Flat Top Systems — Conveying or storage system that provide flat area contact supporting means (such as flat top chain traverse systems, frame rack storage areas or road vehicles).

<i>Characteristic</i>	<i>Requirement</i>
a) Percentage of contact area supporting base of device, not otherwise supported	20 percent, <i>Min</i>
b) Allowable overhang (unsupported, such as by rollers)	311 mm, <i>Max</i>
c) Allowable spacing between support surfaces lateral to movement, not otherwise supported	406 mm, <i>Max</i>
d) If spacing exists between supports in direction of movement, this allowable spacing shall be	305 mm, <i>Max</i>
e) Edge radius	1.50 mm, <i>Min</i> for all edges

2.3 Conveyor Systems — General Requirements

2.3.1 The conveyor systems of two mated pieces of equipment shall be at the same level with respect to each other, consistent with the size and stiffness of the device, so that the load when being transferred from one piece of equipment to the other is never totally supported by a single line of rollers or balls in a cresting situation or two lines in a bridging situation.

2.3.2 An edge or lead roller shall be provided that has the maximum possible diameter commensurate with design or order to absorb the initial impact load caused by transferring devices.

2.3.3 Systems design shall provide that when a device is transferred between pieces of equipment, the maximum allowable span between roller centrelines shall be 254 mm. Each piece of equipment shall have its conveying surfaces within 75 mm of the extreme projection of the bed in the direction of the device movement. Any remaining structural projection shall be ramped or sloped off at 45° *Min* with no sharp edges.

2.3.4 All walk ways, beams or other structures shall be at least 9.5 mm below the top of the conveying surface.

2.3.5 Conveying surfaces shall be capable of conveying distributed downward force loads of 14.5 kN/m²*; and of supporting distributed downward force loads of 29.0 kN/m².

2.4 Stops and Guides

2.4.1 All mobile equipment shall have means to restrain devices adequately in fore, aft, lateral and vertical directions, while in transit. (A device which escapes its restraint causes damage to personnel and equipment).

- Unless specifically exempted by the device configuration, guide rails and end stops shall extend at least 102 mm above the conveying surface.
- The maximum centre-to-centre distance for stops shall not exceed 1 270 mm. The minimum width shall be 50 mm.
- Guides shall be smooth and as continuous as is practical. Generous lead-in flares shall be provided to guide devices into position and to minimize impact loads.
- The lateral dimensional clearance between guides and devices to be handled shall be 13 mm minimum and 16 mm maximum. For example, where the device is 2 235 mm wide, the distance between the guides shall be 2 248 mm minimum and 2 251 mm maximum.

*1 N/m² = 1 Pa.

2.4.2 Where vertical restraint lips are provided, they shall extend not more than 25 mm maximum 22 mm minimum horizontally over the conveying surface.

Vertical restraint members shall measure at least 32 mm from top of the conveying surface to the underside of the restraint member.

2.4.3 A means of absorbing energy, incorporating stops, shall be used where the anticipated impact velocity shall be greater than 0.3 m/s. The energy absorption means shall reduce the impact to the equivalent of a device loaded to one half its containing capacity striking the stops at 0.3 m/s and coming to rest within 3.2 mm while itself not exceeding a deflection of 12.7 mm.

2.4.4 No part or parts of the handling equipment shall scratch or damage the unit load device.

2.4.5 Means, such as roll-off stops, shall be incorporated to preclude inadvertent movement of a device off a handling system.

3. Procedures and Practices

3.1 Transporting Loaded Aircraft Unit Load Device

3.1.1 Transport speeds shall be in accordance with the Table 1.

TABLE 1 TRANSPORT SPEEDS

Tyre type Suspension	Solid Metal	Solid Rubber	Zero Pressure*	Pneumatic
	km/h	km/h	km/h	km/h
Unsprung	8	13	24	32
Sprung	—	25	32	Road speeds

*Cushion type solid rubber tyres of pneumatic configuration.

3.1.2 When transporting loaded cargo containers, all doors shall be closed and latched.

3.1.3 When transporting empty cargo containers, doors shall be either closed and latched, or secured within the container.

3.1.4 When transporting non-structural igloos, loaded or empty, all net fittings at pallet and at net closing shall be secured.

3.1.5 When transporting pallets/net combinations, loaded or empty, the net shall be contained within the periphery of the pallet edge member.

3.1.6 Unless used with ancillary handling equipment meeting the requirement of this standard, or unless the device is designed for such handling, fork lifts may not be used to move devices.

3.1.7 Except for devices such as empty pallets and some 2 440 mm × 2 440 mm containers specifically designed for stacking, devices shall not be stacked.

3.1.8 Restraints as provided for in 2.4 shall be applied prior to movement.

3.1.9 If equipment utilizing multi-directional conveyor surfaces is used for the purpose of transporting devices, protection equivalent to 2.1.1 shall be provided.

EXPLANATORY NOTE

The minimum requirement for handling and restraint of unit load devices to ensure interchangeability have been covered in IS : 11436-1985 'General requirement for ground handling and transport systems equipment for the air cargo unit load devices'. This standard covers the requirements for those portions of the aircraft unit load devices ground and terminal handling equipment that shall have a direct bearing on the life of the device for the purpose of preventing undue wear on the device and also for conveyor systems, dollies, storage provisions, pallet build-up hoists or other device-handling equipment.

The term 'device' used in this standard is intended to mean aircraft unit load device (ULD). Aircraft unit load devices can be containers, galley modules and pallets for aircraft galley and cargo systems. These devices usually form an integral part of the aircraft and as such are subject to regulatory agencies requirements to assure structural integrity.

This standard is based on ISO 4116-1980 'Ground equipment requirement for compatibility with aircraft unit load devices' issued by International Organization for Standardization (ISO).